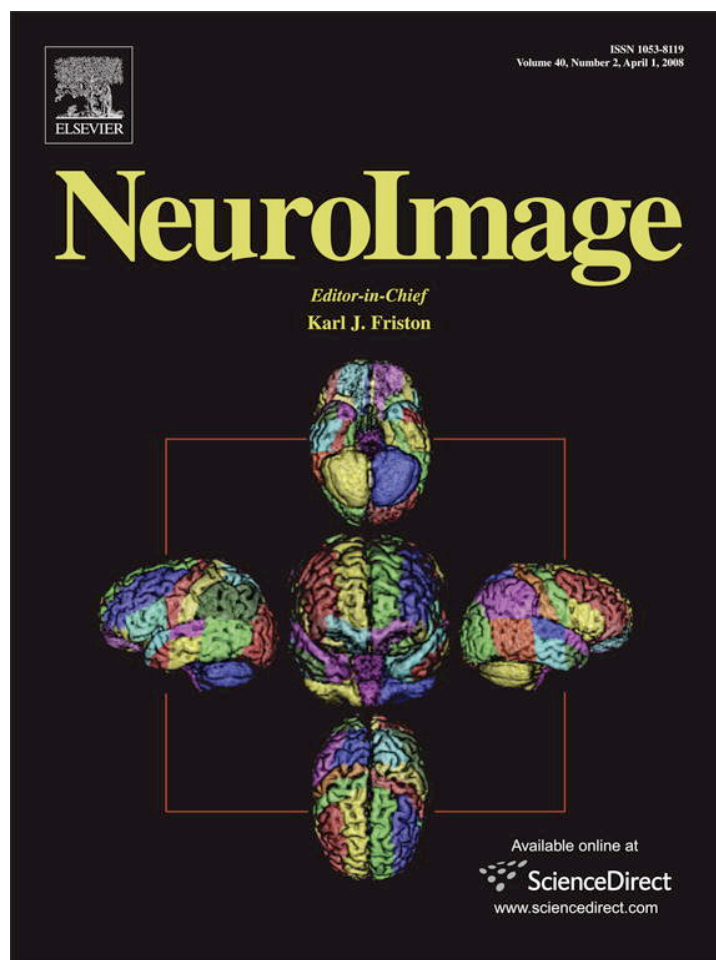


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## Event-related potential characterisation of the Shakespearean functional shift in narrative sentence structure

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Neurolinguistic studies have scrutinised the physiological consequences of disruptions in the flow of language comprehension produced by violations of meaning, syntax, or both. Some 400 years ago, Shakespeare already crafted verses in which the functional status of words was changed, as in “to lip a wanton in a secure couch”. Here, we tested the effect of word class conversion as used by Shakespeare – the functional shift – on event-related brain potential waves traditionally reported in neurophysiolinguistics: the left anterior negativity (LAN), the N400, and the P600. Participants made meaningfulness decisions to sentences containing (a) a semantic incongruity, (b) a functional shift, (c) a double violation, or (d) neither a semantic incongruity nor a syntactic violation. The Shakespearean functional shift elicited significant LAN and P600 modulations but failed to modulate the N400 wave. This provides evidence that words which had their functional status changed triggered both an early syntactic evaluation process thought to be mainly automatic and a delayed re-evaluation/repair process that is more controlled, but semantic integration required no additional processing. We propose that this dissociation between syntactic and semantic evaluation enabled Shakespeare to create dramatic effects without diverting his public away from meaning.

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### Introduction

Early Modern English (1500–1700) text structure was more flexible than that of the present-day (Abbott, 1869). The Subject–Verb–Object pattern had already established itself as the default sentence order in the period; however, in comparison to the

present-day, a greater variety of syntactic patterns were allowed, often as a way to highlight the important constituents of the sentence and to create an element of surprise. Changing sentence patterns were not the only rhetorical device commonly used in the period, though. A remarkable characteristic of the Elizabethan language was what we nowadays call functional shift or word conversion (Quirk et al., 1985), namely, the process whereby one part of speech becomes another with different function, as the word ‘boy’ in “I shall see/Some squeaking Cleopatra *boy* my greatness/I the posture of a whore” (Shakespeare, 2005a). Shakespeare’s plays constitute a state-of-the-art example of this trend of use.

Functional shift is a tool that Shakespeare selectively used to work against the laws of grammar (Blake, 1983). It offers a small, powerfully compressed epitome of Shakespeare’s thinking: a rapid linguistic shift that relates to Shakespeare’s gift for moving quickly from one sense to another in the sudden creation of metaphor. The rebel, Jack Cade complains to Lord Saye in *The Second Part of Henry VI*, “Thou hast most traitorously corrupted the youth of the realm in erecting a grammar school.... It will be proved to thy face that thou hast men about thee that usually talk of a noun and a verb and such abominable words as no Christian ear can endure to hear” (Shakespeare, 2005b). But Shakespeare himself exploited the positive mental activity excited by immediately converting noun to verb or verb to noun. Research on the stylistic value of word conversion and its importance as a means of enlarging a language’s lexicon is not uncommon in previous literature (Nevalainen, 1999). However, the mechanism by which such rhetorical device affects activity in the human brain, is unknown.

With the advent of event-related potentials (ERPs), psycholinguistics entered a new age in that processes of language comprehension can be decomposed in elementary cognitive processes and directly related to brain activity. For example, based on observations of the average electrical activity produced by the brain over the scalp in response to the presentation of written or spoken words, neurolinguists have described peaks of activity

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indexing semantic (Kutas and Hillyard, 1980, 1984), morphosyntactic (Friederici and Jacobsen, 1999; Hagoort, 2003; Munte et al., 1993; Palolahti et al., 2005), word category (Osterhout, 1997), and phrase structure analysis (Friederici et al., 1999; Gunter and Friederici, 1999). Here we studied the way in which the Shakespearean functional shift is integrated at a neural level based on ERP indices of semantic and grammatical processing. On the one hand, unexpected semantic content modulates the N400, a negative wave with an average peaking latency of 400 ms post-stimulus thought to index semantic integration mechanisms (Kutas and Hillyard, 1980, 1984). On the other hand, syntactic violations have been shown to trigger one or two components distinct from the N400 wave: namely (a) a left anterior negativity (LAN) which is not always observed and tends to vary in latency and topography depending on the type of violation encountered (Friederici, 2002; Friederici et al., 1993; Hagoort et al., 2003; Hahne and Friederici, 1999) and (b) a late parietal positive wave peaking around 600 ms post-stimulus, the P600, also referred to as the syntactic positive shift (SPS), which has been associated with late syntactic re-evaluation processes or “second-pass” resolution of syntactic anomalies (Friederici and Jacobsen, 1999; Hagoort, 2003; Hagoort et al., 1993; Hahne and Friederici, 1999; Osterhout, 1997).

We took authentic examples of Shakespeare's functional shifts from two sources: (a) comments and/or examples provided in scholarly publications on Shakespeare's language, and (b) word-lists of each of Shakespeare's plays. We checked the historical standing of the functional shifts in the Oxford English Dictionary, and incorporated them into sentences diluted into modern English to characterise the pattern of physiological activity elicited by such ‘pure’ word class violations. We then investigated the ERP components modulated when our Shakespeare writes: “lip something loving in my ear” instead of “whisper something loving in my ear”.

## Materials and methods

### Participants

Twenty-one young university students (mean age = 20.4 ± 3.6 years, 16 women, 4 left-handed) took part in the study that was approved by the ethics committee of Bangor University. They were paid with course credits or cash. Informed consent was obtained after the nature and possible consequences of the studies were explained. All participants had normal or corrected-to-normal vision and no self-reported symptoms of developmental dyslexia or neurological history. In order not to bias the investigation in terms of prior experience with reading literary texts, no subjects were recruited from literary and/or linguistic degrees.

### Stimuli

We extracted 40 functional shifts from their original setting in verses from Shakespeare's works and created a context in modern English so as to create an expectation for the critical word. Special emphasis was placed on keeping a balance between faithfulness to the original text and semantic transparency. In particular, we provided a clear contextualising environment at the beginning of the example, which did not normally bear much resemblance (in terms of wording) to the original Shakespearean text, but ensured a semantically transparent context in which to expect the critical word. As a consequence, the critical word was always located in

the second of two phrases separated by a comma, colon, or semicolon, trying to keep surrounding words as close to the original as possible. In general, the functional shifts were of the three most common types found in Shakespeare's works: noun-to-verb (65%), verb-to-noun (15%), and adjective-to-verb (15%, Table 1 provides the list of words used and the two exceptions accounting for the remaining 5%).

We then generated 120 other sentences in which only the critical word was replaced by (a) a correct grammatical equivalent that could be semantically expected; (b) a grammatically correct but semantically incongruent word; and (c) a semantically and grammatically unsuitable word (see full stimulus list in Appendix A). Given the fact that critical words were different in the four experimental conditions, they were matched across conditions for a number of dimensions (Table 2), i.e., lexical frequency, number of letters, numbers of phonemes, and number of syllables (Coltheart, 1981). Word concreteness and word familiarity ratings were also matched between conditions depending on their availability (Table 2).

By definition, functionally shifted words do not have a valid lexical frequency or concreteness rating. We therefore considered them matched *ipso facto* to their correct grammatical equivalent. We also included 8 sentences as practice items never presented during the test phase. Sentences had a mean length of 13 ± 2 words. None of the critical words had more than 11 letters and critical word length ranged 3 to 11 letters.

### Experimental design and procedure

Participants read sentences pertaining to the four conditions, i.e., semantically expected and syntactically correct (control

Table 1  
Main types of functional shifts used in the study

Noun → Verb	Adjective → Verb	Verb → Noun
Affection	Clear	Accuse
Bench	Dumb	Annoy
Boy	Safe	Disclose
Bride	Stranger	Dispose
Child	Thick	Exclaim
Companion	Unhappy	Impose
Description		
Foot		
Fortune		
Friend		
Glove		
God		
Grave		
King		
Knee		
Lethargy		
Lip		
Lord		
Medicine		
Monster		
Office		
Season		
Spaniel		
Window		
Wife		
Woman		

Note. Two functional shifts were unique: “prepare” (verb-to-adjective) and “gospel” (noun-to-adjective).

Table 2  
Control of stimulus properties between experimental conditions

Property	Control condition	Functional shift	Semantic violation	Double violation
Log (lexical frequency)	1.82 (2.03)	1.84 (1.92)	1.68 (1.82)	1.76 (1.9)
Familiarity	552 (8)	554 (8)	540 (16)	568 (11)
Concreteness	444 (22)	482 (21)	504 (26)	487 (21)
<i>N</i> syllables	2 (0.1)	2 (0.1)	2 (0.1)	2 (0.1)
<i>N</i> phonemes	5 (0.2)	5 (0.3)	4 (0.2)	5 (0.3)
<i>N</i> letters	6 (0.3)	6 (0.3)	6 (0.2)	6 (0.3)

Mean values are reported with standard deviation of the mean between brackets. There were no significant differences between experimental conditions in any of the *t*-test pair-wise comparisons made (all *ps* > .1, uncorrected for multiple comparisons). For familiarity and concreteness, there were less than 50% missing values in all categories and the number of missing values was comparable between conditions (mean proportion of missing value = 38%). Values were taken from the MRC psycholinguistic database (Coltheart, 1981).

sentences, e.g., I was not supposed to go there alone: you said you would *accompany* me), semantically expected but syntactically incorrect, i.e., a functional shift (e.g., ...you said you would *companion* me), semantically unexpected but syntactically correct (semantic violation, e.g., ...you said you would *incubate* me), and both semantically unexpected and syntactically incorrect (double violation, e.g., ...you said you would *charcoal* me). The conditions thus complied to a fully balanced two-by-two experimental design with semantic status (correct vs. incorrect) and syntactic status (correct vs. incorrect) as factors.

Participants were asked to indicate whether each sentence was overall acceptable, i.e., whether or not they could understand what was meant even though it may have seemed odd by pressing two designated buttons. Given that the construction of meaning in literary texts is less constrained than in other written domains, the participants were not explicitly informed about the literary source of the material presented, for this could have had an impact on their tolerance vis-à-vis the syntactic/semantic deviations encountered. The first phrase – ending in a comma, colon or semi-colon – was presented all at once and was designed to set the semantic context. The second phrase was presented one word at a time, displayed for 200 ms with an inter-stimulus interval of 500 ms, at the centre of a monitor so as to avoid ERP contamination by eye movements. The last word was followed by a 2.5 s pause allowing for participants' response. The critical word, i.e., the word which could coincide with a semantically or syntactically unexpected word, was always presented in the second half of the sentence, anywhere between position 2 and last. Sentences were randomly presented in four blocks of 40 with no repetition of the same phrase prime within each block. Participants indicated whether they could understand the meaning of each presented sentence by pressing keyboard keys set under their left and right index fingers. This task was designed to ensure that all sentences were equally attended to and processed for meaning. They were asked to respond as fast and as accurately as possible and to refrain from blinking during the presentation of a sentence. Before the start of EEG acquisition, participants were presented with 8 practice sentences different from the test sentences. They were given on-line feedback using the words "correct" and "incorrect" displayed immediately after the button press. The test session was started after potential questions triggered by the practice phase had been answered by the

experimenter. Block order and response side were counterbalanced between participants.

#### ERP recording

Electrophysiological data were recorded in reference to Cz at a rate of 1 kHz from 64 Ag/AgCl electrodes placed according to the extended 10–20 convention. Impedances were kept below 7 k $\Omega$ . EEG activity was filtered on-line band pass between 0.1 Hz and 200 Hz and re-filtered off-line with a 30 Hz low pass zero phase shift digital filter. Eye-blinks were detected using the vertical electrooculogram bipolar channel. Potential variations exceeding a threshold of 20% of maximum EEG amplitude over the duration of a complete individual recording session were automatically registered as artefacts and contributed to the computing of a model blink artefact (derived from more than 100 individual blink artefacts in each participant). Artefacts were then individually corrected by subtracting point-by-point amplitudes of the model from signals measured at each channel proportionally to local maximum signal amplitude and remaining artefacts were manually dismissed. In any case, eye blink rarely occurred during the presentation of the second phrase in which the critical word was presented because the participants were instructed to avoid blinking during sentence presentation. There was a minimum of 30 valid epochs per condition in every subject (mean number of accepted trials = 38  $\pm$  2). Epochs ranged from –100 to 750 ms after the onset of the critical word. Baseline correction was performed in reference to pre-stimulus activity and individual averages were digitally re-referenced to the global average reference. Behavioural data were collected simultaneously to ERP data.

#### ERP data analysis

Peak detection was carried out automatically, time-locked to the latency of the peak at the electrode of maximal amplitude on the grand-average ERP. Mean ERP amplitudes were measured in temporal windows determined based on variations of the mean global field power measured across the scalp (Picton et al., 2000): 100–150 ms for the P1, 170–230 for the N1, 320–430 ms for the LAN, 350–550 ms for the N400, and 550–700 ms for the P600. Mean ERP amplitude differences were tested in sets of electrodes defined a priori based on the topography reported previously for each of the studied waves and in which ERP amplitudes were maximal: O1, PO3, PO7, O2, PO4, PO8 for P1 and N1; F5, F3, FC3, FC1 for the LAN; and CP1, CP2, CPZ, P1, P2, PZ for the N400 and the P600. Mean ERP amplitudes were subjected to a repeated measures analysis of variance with semantic incongruence (congruent/incongruent), syntactic violation (incorrect/correct), and electrode (6 or 4 levels) as factors using a Greenhouse–Geisser correction where applicable.

#### Results

There was a main effect of syntactic violation on error rates ( $F_{1,20}=28.2$ ,  $p<.0001$ ) indicating less errors for syntactically correct than incorrect sentences and a main effect of semantic incongruence ( $F_{1,20}=21.4$ ,  $p<.0001$ ) such that semantically sound sentences elicited less errors than those containing a semantically unexpected word (Fig. 1). The two factors interacted ( $F_{1,20}=32.9$ ,  $p<.0001$ ) due to the functional shift condition generating more errors than all other conditions. There was also a main effect of

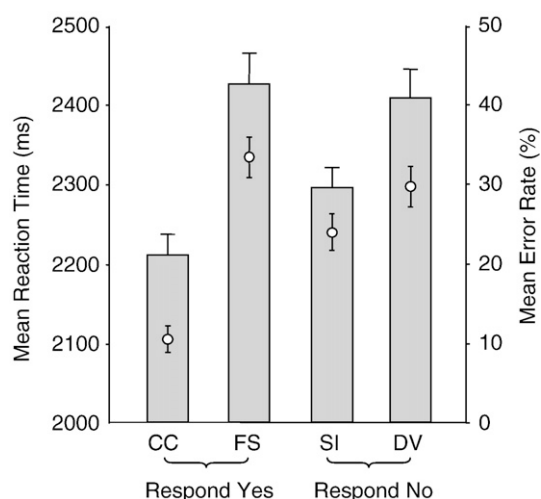


Fig. 1. Behavioural performance. Reaction times (bars) and error rates (bullets) in the four experimental conditions. CC: control condition; FS: functional shift; SI: semantic incongruence; DV: double violation. Error bars depict standard error of the mean in all cases.

syntactic violation on reaction times ( $F_{1,20}=25.9, p<.0001$ ) showing that participant responses were slower for syntactically incorrect than correct sentences but there was no main effect of semantic incongruence ( $F_{1,20}=2.73, p>.1$ ) and no interaction.

Analysis of the ERPs elicited by the critical word in the four experimental conditions included all experimental trials,

that is, both the trials in which participants judged the meaningfulness of the sentence as expected and those in which they gave the unexpected answer. Note, however, that a second analysis based on the “correct” trials only yielded the same qualitative results as the all-inclusive analysis and is therefore not reported.

The P1/N1 complex was not affected in amplitude or latency by either of the experimental factors. In the following, we do not report detailed results on peak latencies because there were either no significant effects of experimental factors on peak latencies (left anterior negativity and centroparietal negativity) or no clearly identifiable peaks (late centroparietal positivity).

The first ERP differences between conditions appeared approximately 320 ms after stimulus onset of the critical word in the form of a main effect of syntactic violation on mean ERP amplitudes ( $F_{1,20}=0.9, p<.05$ ) over the left anterior scalp (F5, F3, FC3, FC1) in the absence of a semantic incongruence main effect over these same electrodes ( $F_{1,20}=1.16, p>.1$ ) and no interaction ( $F_{1,20}=1.26, p>.1$ ). The syntactic violation main effect was characterised by greater negative amplitudes in the two syntactically incorrect conditions (double violation and functional shift) as compared to the syntactically correct conditions (semantic incongruence and control sentence). Fig. 2 shows the early syntactic violation main effect over nine regions.

The 4 experimental conditions were maximally discriminated at electrode FC3 (Fig. 3a) and the syntactic violation main effect had a left anterior focus (Fig. 4a).

Significant mean ERP amplitude differences induced by the semantic incongruence main effect appeared between 350 and

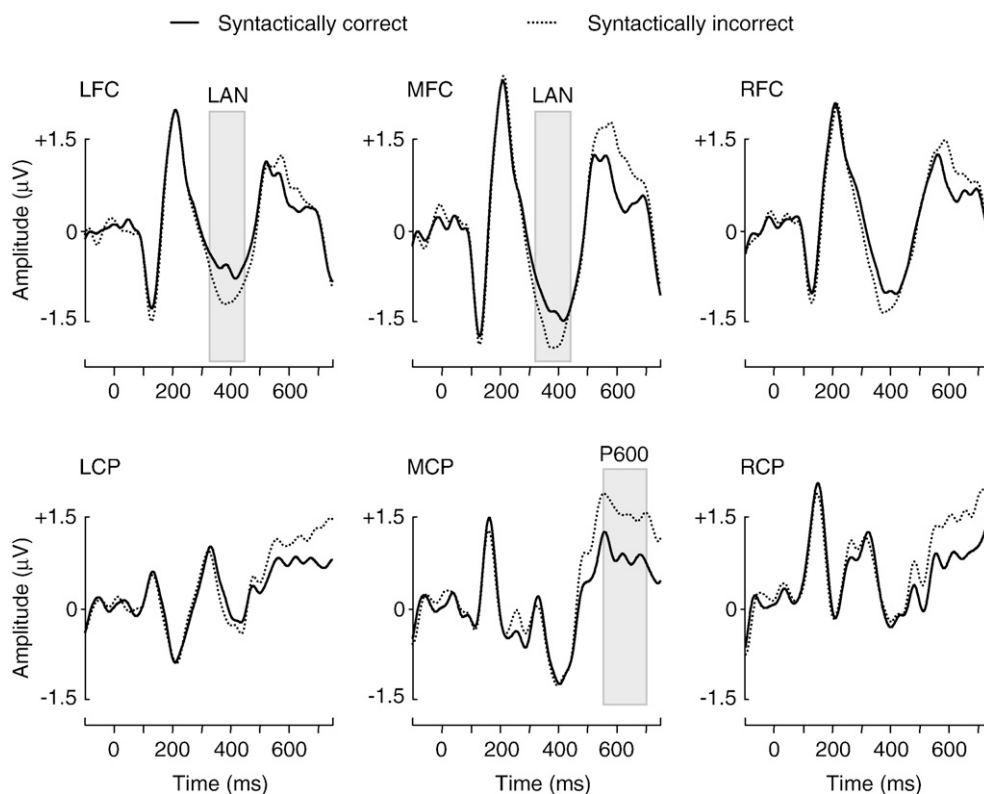


Fig. 2. Syntactic violation main effect on ERPs over six regions. LFC: left frontocentral (linear derivation of FC1, FC3, C1, and C3); MFC: medial frontocentral (linear derivation of FCz and Cz); RFC: right frontocentral (linear derivation of FC2, FC4, C2, and C4); LCP: left centroparietal (linear derivation of CP1, CP3, P1, and P3); MCP: medial centroparietal (linear derivation of CPz and Pz); RCP: right centroparietal (linear derivation of CP2, CP4, P2, and P4).

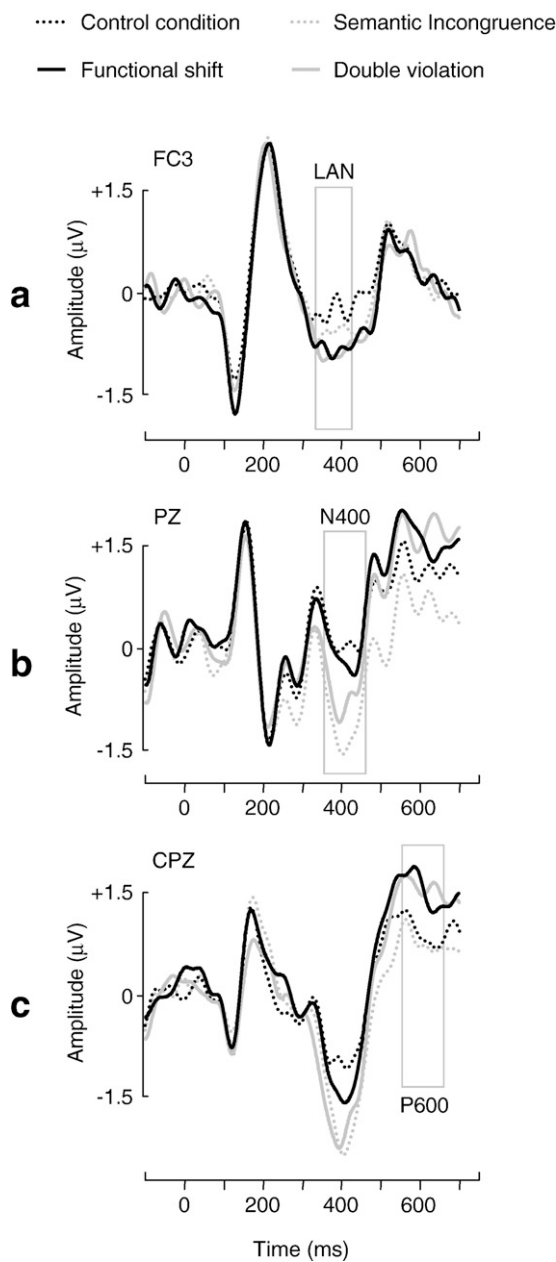


Fig. 3. ERPs in the four experimental conditions in three time windows at three maximally discriminative electrodes. (a) Early syntactic violation effect at electrode FC3; (b) Semantic incongruence main effect at electrode Pz; (c) Late syntactic violation main effect at electrode CPZ.

550 ms after stimulus onset over the centroparietal scalp ( $F_{1,20}=11.50$ ,  $p<.01$ ). In particular, semantically unexpected words elicited greater negative amplitudes than semantically expected words, irrespective of their syntactic status (Fig. 5).

Over the centroparietal region where this effect was maximal (Fig. 4b), and in the same time window, there was no main effect of syntactic violation ( $F_{1,20}=.15$ ,  $p>.1$ ), and no interaction between semantic incongruence and syntactic violation ( $F_{1,20}=.37$ ,  $p>.1$ ). More specifically, inspection of the ERPs recorded in the four experimental conditions showed a separation of the two semantically congruent conditions from the two incongruent conditions (Fig. 3b). It is noteworthy that comparing the functional shift

condition directly with the control condition between 350 and 550 ms failed to even reveal a difference trend ( $F_{1,20}=0.315$ ,  $p=.581$ ).

The main effect of semantic incongruence faded at around 500 ms after the onset of the critical word. Shortly after, between 550 and 700 ms, a second main effect of syntactic violation on mean ERP peak amplitudes was found over the centroparietal scalp ( $F_{1,20}=14.27$ ,  $p<.001$ ). In particular, syntactic violations elicited significantly greater ERP amplitudes than syntactically correct conditions (Fig. 2). Over the centroparietal region where this effect was maximal (Fig. 4c), and in the same time window, ERP mean amplitudes were insensitive to semantic incongruence ( $F_{1,20}=1.35$ ,  $p>.1$ ) and there was no interaction between syntactic violation and semantic incongruence ( $F_{1,20}=0.81$ ,  $p>.1$ ). Inspection of the four separate conditions showed a separation between the two syntactically correct and the two syntactically incorrect conditions (Fig. 3c).

In summary, the functional shift condition elicited a ‘pure’ syntactic violation indexed by an early left anterior negativity and a late centroparietal positivity in the absence of a significant centroparietal negativity.

In order to test for possible relationships between behavioural performance in the assigned task and ERP effects, participants were split into two groups based on their error rates: a group of 11 participants with less than 33% errors and a group of 10 participants with more than 33% errors. This performance group factor was then included in a post hoc analysis comparing mean ERP amplitude difference between the functional shift and the control condition in the three temporal windows highlighted above. None of the ERP modulations found were accompanied by or significantly interacted with an effect of group: syntactic violation main effect on anterior negativity ( $F_{1,19}=1.411$ ,  $p=.249$ ), semantic incongruence main effect on centroparietal negativity ( $F_{1,19}=0.0003$ ,  $p=.99$ ), and syntactic main effect on late centroparietal positivity ( $F_{1,19}=2.124$ ,  $p=.161$ ).

## Discussion

Error rates peaked for the functional shift condition but remained below chance (Fig. 1) and reaction times for correct trials were overall significantly longer for syntactic violations than syntactically correct sentences. Therefore, judging from overt measures of sentence processing, participants found word class conversions rather difficult – but not impossible – to integrate. In other words, on the surface, the Shakespearean functional shift appeared to have a detrimental effect on sentence comprehension since this condition generated the largest number of error and the longest reaction times.

The first ERP modulation by syntactic violation between 320–430 ms had a left anterior topography consistent with the topography often reported for the LAN (Friederici, 2002; Hahne and Friederici, 1999). Although it is not found in all studies involving syntactic violations (Hagoort et al., 1993; Osterhout, 1997; Osterhout et al., 2002), the LAN has been observed in numerous studies involving morphosyntactic violations and/or anomalies preventing syntactic binding (Friederici, 2002; Friederici et al., 1993; Hagoort, 2005; Hagoort and Brown, 2000; Hagoort et al., 2003; Munte et al., 1993). Our results are consistent with the view that the LAN in the 300–500 ms range indexes a failure to bind constituents within the syntactic frame of the sentence (Hagoort, 2005; Hagoort et al., 2003). In the split-half analysis of

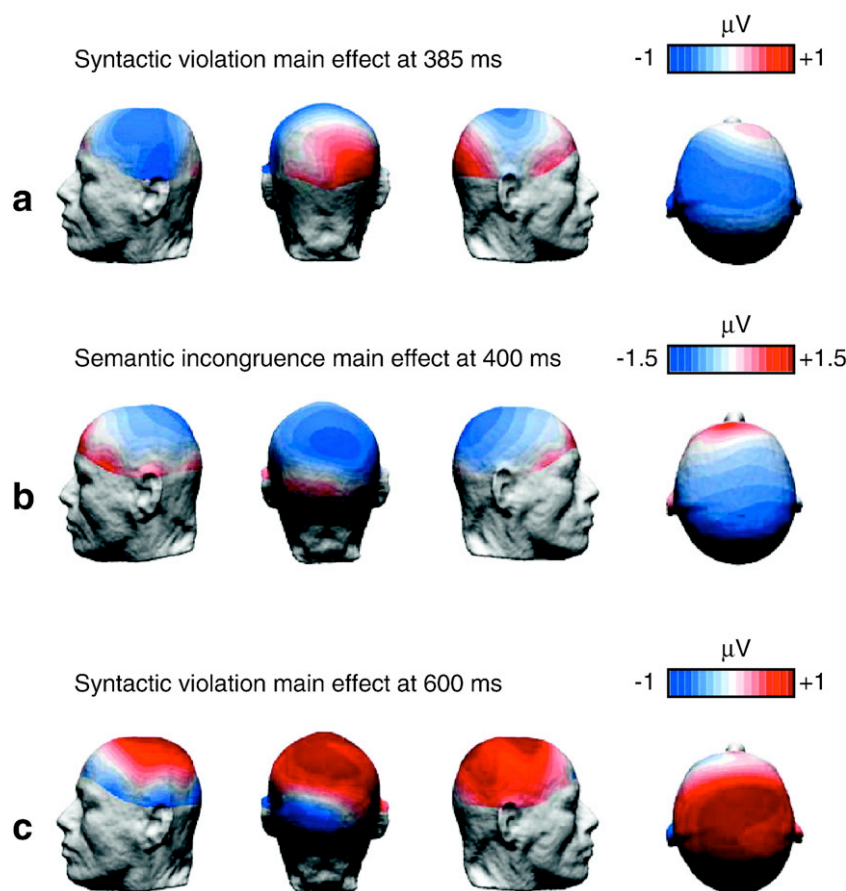


Fig. 4. Differential topographies of the syntactic violation and semantic incongruence main effects. (a) Early syntactic violation effect at 385 ms ([functional shift+double violation]–[semantic violation+control condition]); (b) Semantic incongruence main effect at 400 ms ([semantic violation+double violation]–[functional shift+control condition]); (c) Late syntactic violation main effect at 600 ms ([functional shift+double violation]–[semantic violation+control condition]).

the participants, we found no effect of group, which shows that the LAN is not trivially related to subsequent overt evaluation of sentence content.

The effect of semantic incongruence on ERP mean amplitudes in the 350–500 ms window had all the characteristics of the classical N400, a wave traditionally seen as an index of semantic integration difficulty or semantic re-evaluation (Kutas and Hillyard, 1980, 1984). In the case of the Shakespearean functional shift, words which had their syntactic status changed but were semantically expected in the context of the sentence did not significantly increase the amplitude of the N400 and therefore required a comparable level of neural processing as semantically and syntactically expected words. This result is compatible with those of previous studies which have attempted to create artificial sentences comprising pure syntactic violations (Friederici and Jacobsen, 1999). However, here this result was obtained with functional shifts used by Shakespeare. The split-half analysis failed to indicate a relationship between participants' performance in the sentence judgment task and the amplitude of the N400 modulation between the functional shift and control condition (see Olichney et al., 2000).

The positive variation found in the 550–700 ms window had all the characteristics of the P600/SPS wave, which has been observed in experiments where the syntactic structure of a sentence is disrupted by a word class error (Osterhout, 1997), a morphosyn-

tactic violation (Friederici and Jacobsen, 1999; Hagoort, 2003; Palolahti et al., 2005), or a phrase structure violation (Friederici et al., 1999; Gunter and Friederici, 1999). This positivity has been interpreted as a delayed P300 event (Coulson et al., 1998) indexing the difficulty of syntactic processing (Kaan et al., 2000; Kaan and Swaab, 2003) or syntactic reanalysis and sentence repair processes (Friederici, 2002). Therefore, despite the absence of a semantic integration cost in the functional shift condition, the syntactic violation induced a response comparable to that elicited by words that are both semantically and syntactically aberrant in the form of a LAN/P600 complex.

The manifestations of semantic incongruence and syntactic violations observed here are consistent with results obtained in other studies using artificially constructed sentences (Ainsworth-Darnell et al., 1998; Osterhout and Nicol, 1999) and in previous works involving morphosyntactic violations in lieu of word class errors (Hahne and Friederici, 1999; Hagoort, 2003). Our overall results are consistent with the hypothesis put forward by several authors that semantic and syntactic processing are partially independent, particularly in the late stages of neural integration (Ainsworth-Darnell et al., 1998; Hagoort, 2003; Osterhout and Nicol, 1999)—at least as regards the specific phenomenon under investigation here, i.e., Shakespearean word class conversion. We speculate that Shakespeare took advantage of the possibility to change the syntactic status of words without changing the

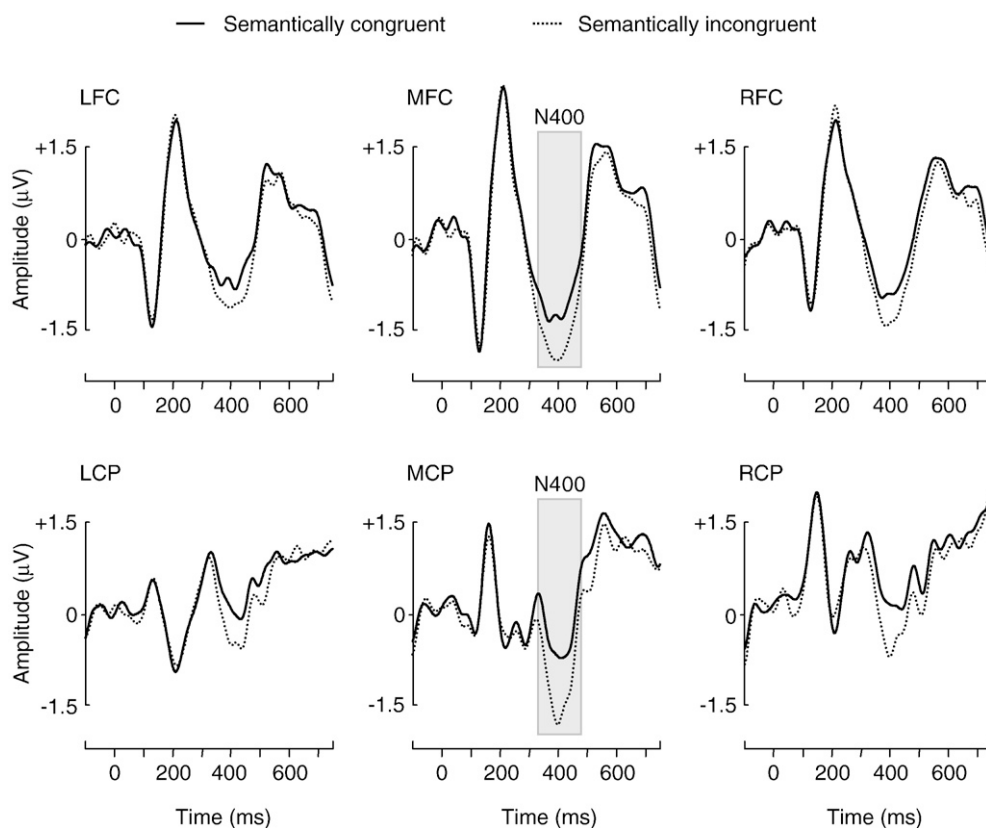


Fig. 5. Semantic incongruence main effect on ERPs over six regions. LFC: left frontocentral (linear derivation of FC1, FC3, C1, and C3); MFC: medial frontocentral (linear derivation of FCz and Cz); RFC: right frontocentral (linear derivation of FC2, FC4, C2, and C4); LCP: left centroparietal (linear derivation of CP1, CP3, P1, and P3); MCP: medial centroparietal (linear derivation of CPz and Pz); RCP: right centroparietal (linear derivation of CP2, CP4, P2, and P4).

pragmatic content of the discourse. Whether or not Shakespeare deliberately relied on the multi-dimensional effect (automatic and controlled) of the syntactic violation to charge the meaning of the verse in which the functional shift is embedded, this manipulation creates surprise without altering meaning.

## Conclusion

Our study shows that it is possible to address questions of interest to scholars in art and humanities using methods so far restricted to neuroscientific approaches. It opens up interdisciplinary avenues for investigating the interface between literature and neuroscience. It must be kept in mind, however, that studies attempting to measure the neurophysiological effects of literary works in an “ecological” fashion will inevitably face two major challenges: (a) the spirit of the time and the way in which contemporaries of Shakespeare appreciated his works is forever lost; (b) using excerpts from literary works in their original format precludes virtually all forms of stimulus control. In the future, investigations of the neural events triggered by the Shakespearean functional shift and other literary devices using, for instance, brain imaging will shed light on potential interactions between language and emotion networks and further characterise the relative functional independence of syntax and semantics observed here (Humphries et al., 2006; Kuperberg et al., 2003). For instance, future investigations may focus on the effects caused by the functional shift beyond its locus, considering, from a literary point

of view, that the Shakespearean device also affects the processing of the neighbouring lines.

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## Appendix A. Full stimulus set

Alternatives to the critical word are given between brackets. The functional shift is in bold, followed by the double violation condition (semantically incongruent and syntactically incorrect), followed by the semantic violation.

I was not supposed to go there alone: you said you would accompany [**companion** / charcoal / incubate] me.

They thought so well of the hero that they deified [**godded** / canded / printed] him.

She was so beautiful that she spent her time displaying [**windowing** / hairing / posting] herself to everyone.



Whenever I am in trouble, she truly assists [*friends / grapes / pours*] me.

I cope well with lager but strong wines hurt [*thick / tree / walk*] my thoughts.

At last the dancer is warm, he now treads [*feet / essences / fills*] his way with ease.

My father is so powerful that he governs [*lords / mysteries / wipes*] over all the family.

The poor slave was so obedient that he followed [*spanielled / coffeed / separated*] you at the heels.

I know you don't want to speak, but whisper [*lip / honey / bake*] something loving in my ear.

You depend upon the power of the king and must beg [*knee / idea / lose*] your way into his favour.

You have twenty strong guards around you as you go to guard [*safe / nice / clean*] your progress.

I am such an important man that I cannot allow this comedian to mock [*boy / littoral / mix*] my adult dignity.

The king is dead and feels no more because he now lies buried [*graved / lamped / cooked*] in the lowly ground.

Her father was ashamed of what she had done and she was estranged [*strangered / jawed / bloated*] by his curse.

You slander me. I cannot stay to hear you malign [*monster / cupboard / trigger*] my innocent deeds.

You were someone I always cared for but you are even more valued [*cleared / quicked / smoked*] by your absence.

It is hard to deal with difficulties but love alleviates [*medicines / woods / fascinates*] all pain.

The journey will be long and dangerous and now you must make ready [*prepare / yellow / rain*].

I can walk twenty miles but running ten miles leaves me exhausted [*lethargied / peasanted / gardened*].

The battle could go either way and I anxiously wait to see its outcome [*disclose / deploy / kitchen*].

I try to tell her I love her but she blocks [*dumbs / greens / sings*] my mouth.

He is sad because his aunt has died; he loved [*affectioned / storied / recorded*] her very much.

She hoped to marry him but he was already engaged [*wived / examed / salted*].

An emergency board meeting will be called if the President is unable to perform [*office / kettle / stroke*] his duties.

The show didn't go well and his crew ended up being the object of his choler [*annoy / suffer / county*].

Do not come to me again because I will no longer endure your false charge [*accuse / defrost / cheese*] of treason.

You are not out of supply as you have other resources at hand [*dispose / displace / dessert*].

Lear didn't trust his children in politics, he didn't want them to head [*king / tray / drink*] the country.

He didn't want to talk to anyone but still came to sit [*bench / theory / shake*] by my side.

He hated being in the army because he had to obey commands [*imposes / derails / business*].

You said you feel ill, can you name [*description / redemption / illuminate*] the symptoms to me?

I thought you were far better, you have saddened [*unhappied / uglid / subsided*] me.

They released two of the terrorists from prison; this provoked a public outcry [*exclaim / juggle / giraffe*].

You do not have to shout at me: please calm [*season / road / disturb*] your anger.

It's very cold outside; do cover [*glove / car / write*] your hands.

Although her parents strongly opposed her decision, she married [*brided / cheeked / contained*] him last week.

He has served his country well, so reward [*fortune / priest / agree*] him accordingly.

The doctors told her she was infertile, but she later delivered [*childed / toothed / reacted*] twins.

I could hardly recognise the girls; they have really grown up [*womaned / bloused / created*].

Please tell me the truth: are you so religious [*gospelled / moused / parked*] as to pray for this good man?

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